

REMARKS/ARGUMENTS

In a Final Office Action dated December 15, 2008, claims 1, 2, 5-10, 13-18, 21-29, 32-40, 43-51, 54-62, 65-72, 75-82, 85-92 and 95-117 were rejected under § 103 over U.S. Patent No. 6,763,417 to Paul and claims 3, 4, 11, 12, 19, 20, 30, 31, 41, 42, 52, 53, 63, 64, 73, 74, 83, 84 and 93-94 were rejected under § 103 over Paul in view of U.S. Patent No. 7,107,347 to Cohen. Applicants traverse the rejections and request reconsideration.

Section 102 Rejections

Applicants begin by repeating the arguments made in the prior response, as those remarks are still submitted as being appropriate. Applicants provide specific comments to the remarks provided in the Final Office Action.

Claims 1, 9, 17, 28, 39, 61, 71, 81, 91 and 101

One common element in these claims is either a switching device, switch or method of operating a switch, with the switching device or switch having fabric or F_port, a node or N_port and a switch or switch circuit interconnecting the ports. That portion of each claim has been rejected over Paul. Applicants submit that the Final Office Action errs in several places when rejecting these common elements. Using claim 28 as exemplary, the claim requires “at least one N_port connected to said first fabric.” The Final Office Action has equated this port to an SL_port or E_port as mentioned in Paul and then makes the unsupported allegation that the modification to an N_port would be obvious.

Addressing the remarks out of order, Applicants submit that the unsupported allegation to modify an SL_port or E_port to an N_port is improper. First, no support is provided for this allegation. To form a proper rejection, some support is needed for each allegation. As there is no support for this conclusory statement, the rejection is improper on its face.

The rejection may in part be based on a belief that port types are simply interchangeable. Applicants submit that belief is wrong when discussing Fibre Channel ports. The type of port effectively defines required functionality of that port. An N_port is to provide the functionality of a node, such as initiating login requests and the like. An F_port is to provide complementary functions to the N_port functions. For example, when an N_port provides a fabric login request, the F_port must interact with various items in the fabric, such as the name server, and return the

appropriate information to the N_port. An E_port is used to interconnect to switches which form at least a portion of a fabric. E_ports have a totally different functionality than N_ports or F_ports. E_ports exchange numerous messages relating to fabric configuration and operation. An E_port would never provide a login request or respond to a login request as an E_port does not perform those functions. Similarly, N_ports and F_ports would not be able to provide or respond to the fabric configuration messages of E_ports. Therefore the designations of ports are not mere labels but indeed indicate particular functions which must be performed by the ports. N_ports, F_ports and E_ports are not the same and clearly are not interchangeable. Therefore the statement regarding the motivation to modify Paul ("the port functionality of connecting to a fabric remains the same") is simply erroneous.

SL_ports are not standardized Fibre Channel ports, so reference must be made to Paul to determine the functions of an SL_port. Referring to col. 6, lines 27-33, an SL_port "allows several smaller private loops to be connected through the FCPA to create a bigger loop." This sentence is effectively repeated at col. 8, lines 57-59 cited in the Final Office Action. The col. 6 sentence is very enlightening. The SL_port connects private loops. Thus its operation and function is actually totally opposite of that needed to connect to a fabric, as required in the claim. By definition in Fibre Channel, private devices and private loops cannot operate on a fabric. Private devices only use the lowest 8 bits of the Fibre Channel address bits. Thus operation on a fabric, which requires use of the upper 16 bits of the address, is effectively impossible. With the SL_ports connecting private loops, fabric operation cannot be done. Thus an SL_port could not connect to a fabric as alleged in the Final Office Action. And clearly an SL_port would never be modified to an N_port which is for fabric connection as required in the claim.

Applicants further submit that an E_port is not really a port for connection to a fabric, at least not in the sense of an N_port connecting to a fabric. E_ports are used to form interswitch links (ISLs) between switches to actually form a fabric. While a fabric may be pre-existing when two switches are connected using E_ports, the fabric actually extends to include the new switch with the edge of the fabric thus moving from one switch to the next. When an N_port is connected to a fabric, the fabric does not extend to the node but remains at its same extent. Thus connecting an E_port is very different from connecting an N_port and clearly not analogous or sufficient to render the claim obvious.

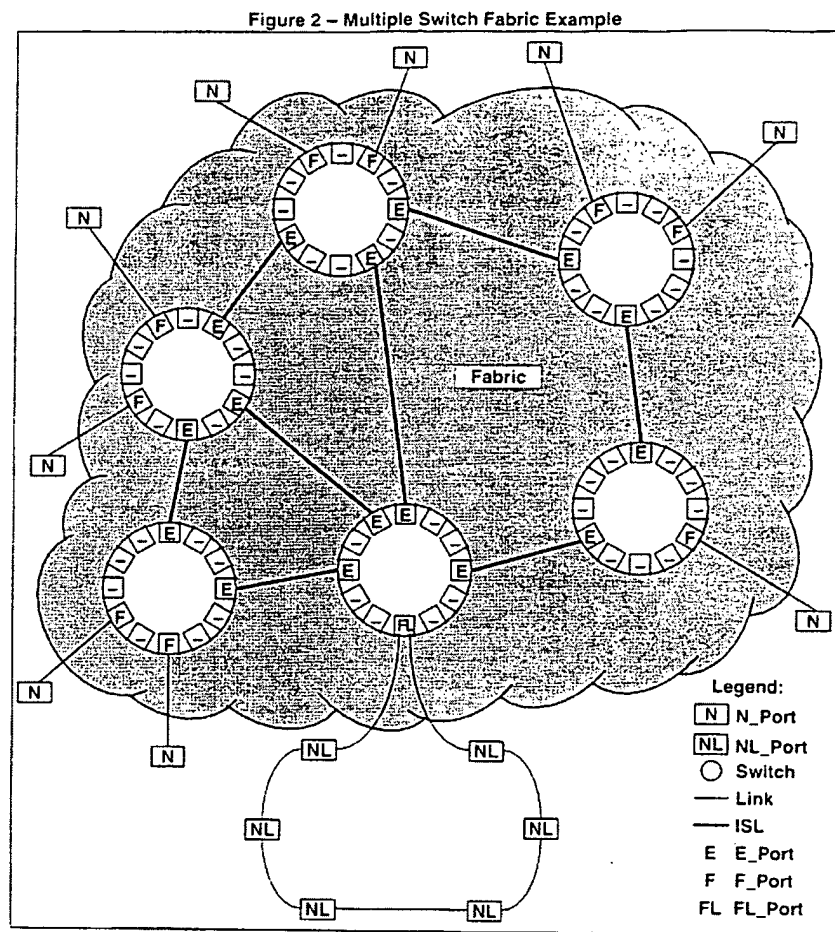
Final Office Action Remarks

The Final Office Action responded to the above arguments by stating:

The applicant(s) argue equating various ports to N_ports as being obvious is unsupported and therefore improper. In response, N_ports (node port) within the element of a Fibre Channel port is merely a port used for connecting to a F_port (fabric port) such that one node may communicate with another node via one or more FCPA (see col.8, lines 34-38). Paul teaches such FCPA's can be connected together to cascade fibre channel switches via a reconfigured E_port (see col.8, lines 62-67). Therefore, when one switch is connecting to another fabric, one of ordinary skill in the art will concur that the switch is another node and the N_port recited is the same as the E_port taught by Paul. Clearly there is sufficient support for the obviousness and therefore the rejection is maintained. The claims are not directed to a novel invention because the applicant(s) claim merely connecting various ports (architecture) within a Fibre Channel network without reciting specific inventive functionality.

Furthermore, the features upon which applicant relies (i.e., "initiating login requests") are not recited in the rejected claim(s). Although this feature can be found in N_ports, such features are not performed because it is not recited. Therefore, just because various functions can be performed does not mean they are and without evidence to support that E_ports are not able to provide the same function of that of N_ports, obviousness will always exist.

As can be seen, the remarks specifically argue that an "N_port recited is the same as the E_Port taught by Paul." One skilled in the Fibre Channel area would understand this to be a wholly improper statement. To support this position, Applicants provide relevant portions of various Fibre Channel specifications, which were previously provided in the Information Disclosure Statement filed May 22, 2008.



This figure from FC-SW, p. 11, provides a good overview of the industry standard relationships between the various port types. As can be seen, N_ports are those on the node devices which attach to the fabric. F_ports are the ports on the switches which connect to the N_ports. E_ports are used to interconnect switches to form the fabric. The following portions of the FC-FG specification are similar.

4.1 Fabric and Fabric Elements

The Fabric is a transport medium that provides switched interconnect between multiple link attachment points called N_Ports. The extent of the Fabric is limited to those Ports that can be addressed by unique values of the 24-bit Port Identifier.

NOTE – In the Fibre Channel context, fabric written with a lower-case 'f' embraces the interconnect of any ports within the 24-bit address space; Fabric written with a capital 'F' describes topologies distinct from Point-to-point topology and Arbitrated Loop topology (see 4.8 of ANSI X3.230, FC-PH). This document describes the Fabric of FC-PH.

A Fabric may be composed of one or more Fabric Elements as illustrated in figure 2. The link attachment point between the Fabric Element and an N_Port is called the F_Port. The link attachment point between one Fabric Element and another Fabric Element is called the E_Port. The link between Fabric Elements is called an Inter-Element Link (IEL).

The Fabric has characteristics defined in terms of the transport services provided on a bidirectional link between the Link Control Facility within a node N_Port and the Link Control Facility within the Fabric F_Port. The Fabric provides transport services by routing frames between F_Ports.

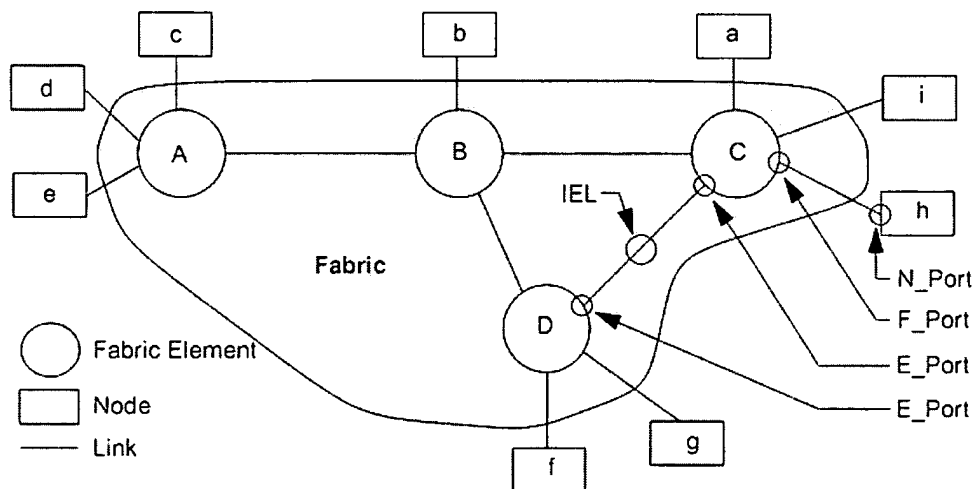


Figure 2 – Fabric model

4.5 FC-PH physical model

Figure 12 depicts the FC-PH physical model and illustrates the FC-PH physical structure and components. The Fibre Channel (FC) physically consists of a minimum of two Nodes, each with a minimum of one N_Port interconnected by a pair of fibres - one outbound and the other inbound at each N_Port. This pair of unidirectional fibres transmitting in opposite directions with their associated transmitters and receivers is referred to in FC-PH as a link. The link is used by the interconnected N_Ports to perform data communication.

Physical equipment such as a processor, controller, or terminal can be interconnected to other physical equipment through these links. Attached physical equipment supports one or more Nodes and each Node contains one or more N_Ports, with each N_Port containing a transmitter and a receiver.

The physical model shown in figure 12 is inherently capable of simultaneous, symmetrical bidirectional flow. A Fabric may be present between the N_Ports and some Fabrics may not support this type of flow. From the perspective

of a given N_Port, for instance A(1) or B(1), its transmitter sends Data frames on the outbound fibre and its receiver receives the responses on the inbound fibre.

In Class 1 service, an N_Port logically performs a point-to-point communication with another N_Port at any given time. This statement is true regardless of the presence of Fabric. However, multiple N_Ports in a Node can simultaneously perform data transfers in parallel with single or multiple N_Ports contained in one or more Nodes (see 4.9.1 and clause 22 for Class of service description).

In Class 2 and Class 3 service, an N_Port may multiplex frames to or demultiplex frames from multiple N_Ports (see 4.9.2, 4.9.3, and clause 22 for Class of service description).

This structure provides the attached equipment flexible mechanisms to perform simultaneous data transfers in parallel, to or from, single or multiple equipments.

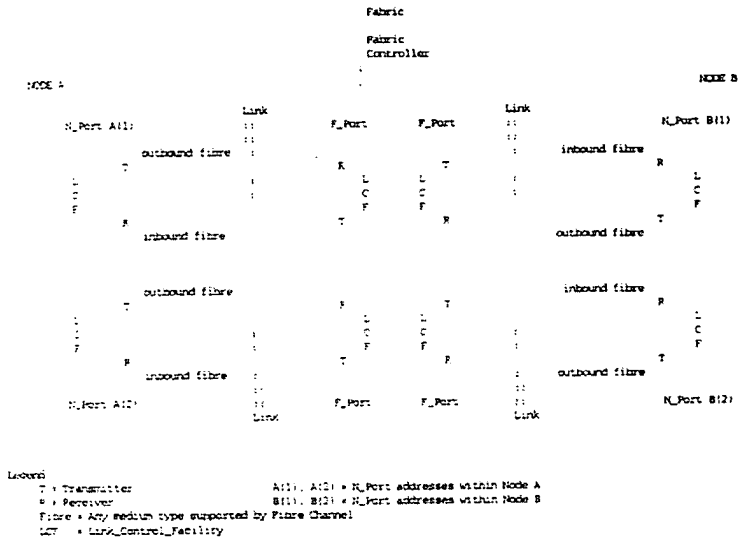
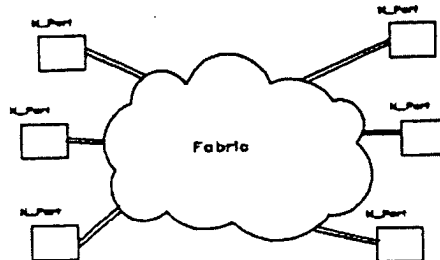


Figure 12 - FC-PH physical model

4.8.2 Fabric topology

This topology uses the Destination_Identifier (D_ID) embedded in the Frame_Header to route the frame through a Fabric to the desired destination N_Port. Figure 14 illustrates multiple N_Ports interconnected by a Fabric.



FC-PH, p. 21

These match the definitions for the ports.

3.1.63. F_Port: The Link_Control_Facility within the Fabric which attaches to an N_Port through a link. An F_Port is addressable by the N_Port attached to it, with a common well-known address identifier (hex 'FFFFFE') (see 18.3, local F_Port, and remote F_Port).

3.1.64. Fabric: The entity which interconnects various N_Ports attached to it and is capable of routing frames by using only the D_ID information in a FC-2 frame header.

3.1.92. Link_Control_Facility: A link hardware facility which attaches to an end of a link and manages transmission and reception of data. It is contained within each N_Port and F_Port.

3.1.107. N_Port: A hardware entity which includes a Link_Control_Facility. It may act as an Originator, a Responder, or both.

FC-PH, p. 6-8

3.1.14 E_Port: As defined in FC-FG (see reference [5]), a Fabric "Expansion" Port which attaches to another E_Port to create an Inter-Switch Link.

3.1.18 F_Port: As defined in FC-PH (see reference [1]). In this Standard, an F_Port is assumed to always refer to a port to which non-loop N_Ports are attached to a Fabric, and does not include FL_Ports.

3.1.19 Fabric: As defined in FC-FG (see reference [5]), an entity which interconnects various Nx_Ports attached to it and is capable of routing frames using only the D_ID information in an FC-2 frame header.

3.1.34 N_Port: As defined in FC-PH (see reference [1]). In this Standard, an N_Port is assumed to always refer to a direct Fabric-attached port, and does not include NL_Ports.

3.1.55 Switch Port: An E_Port, F_Port, or FL_Port.

FC-SW, pp. 3-5.

4.5 Switch Ports

A Switch shall have three or more Switch Ports. A Switch equipped only with F_Ports or FL_Ports forms a non-expandable Fabric. To be part of an expandable Fabric, a Switch shall incorporate at least one Switch Port capable of E_Port operation.

A Switch Port supports one or more of the following Port Modes: E_Port, F_Port, FL_Port. A Switch Port that is capable of supporting more than one Port Mode attempts to configure itself first as an FL_Port (as defined in FC-AL), then as an E_Port (as defined in this Standard), and finally as an F_Port (as defined in FC-PH), depending on which of the three Port Modes are supported by the Switch Port.

The detailed procedure is described in 7.1.

4.5.1 F_Port

An F_Port is the point at which all frames originated by an N_Port enter the Fabric, and all frames destined for an N_Port exit the Fabric. An F_Port may also be the Fabric entry point for frames originated by an N_Port destined for an internal Fabric destination, such as the Fabric Controller. Similarly, an F_Port may also be the Fabric exit point for frames originated internal to the Fabric and destined for an N_Port. Frames shall not be communicated across a Link between an F_Port and anything other than an N_Port.

F_Ports are described in detail in 5.2.

4.5.2 FL_Port

An FL_Port is the point at which all frames originated by an NL_Port enter the Fabric, and all frames destined for an NL_Port exit the Fabric. An FL_Port may also be the Fabric entry point for frames originated by an NL_Port destined for an internal Fabric destination, such as the Fabric Controller. Similarly, an FL_Port may also be the Fabric exit point for frames originated internal to the Fabric and destined for an NL_Port. Frames shall not be communicated across a Link between an FL_Port and anything other than an NL_Port.

FL_Ports are described in detail in 5.3.

4.5.3 E_Port

An E_Port is the point at which frames pass between the Switches within the Fabric. Frames with a destination other than the local Switch or any N_Port or NL_Port attached to the local Switch exit the local Switch through an E_Port. Frames that enter a Switch via an E_Port are forwarded to a local destination, or are forwarded towards their ultimate destination via another E_Port. Frames shall not be communicated across a Link between an E_Port and anything other than an E_Port.

E_Ports are described in detail in 5.4.

FC-SW, p. 13

5.2 F_Port Operation

An F_Port is the point at which an external N_Port is attached to the Fabric. It normally functions as a conduit to the Fabric for frames transmitted by the N_Port, and as a conduit from the Fabric for frames destined for the N_Port.

FC-SW, p. 17

5.4 E_Port Operation

An E_Port is the point at which a Switch is connected to another Switch to create a Fabric. It normally functions as a conduit between the Switches for frames destined for remote N_Ports and NL_Ports. An E_Port is also used to carry frames between Switches for purposes of configuring and maintaining the Fabric.

FC-SW, p. 21

From these materials it is submitted that it is very clear that N_ports, F_ports and E_ports have very distinct operations and are clearly not substitutable as proposed in the Final Office Action remarks.

Addressing some of the specific items in the remarks, Applicants address the statement “Paul teaches such FCPA’s can be connected together to cascade Fibre Channel switches via a reconfigured E_port,” citing Paul, Col. 8, lines 62-67. Those lines in Paul are reproduced here:

required. The third type of port that equipment may support is the E_Port. This interface is used when cascading fibre channel switches. The FCPA port and the port that are linked
65 together discover that each is a switch port and configure themselves as E_Ports. Systems integrators use this capability to build large fabrics.

The section in Paul is discussing normal port initialization operations, which, as noted in 4.5 Switch Ports at FC-SW, p. 13 as copied above, have a switch port step through FL_port, then E_port and finally F_port modes during configuration. The sentence in Paul does not suggest that the ports are equivalent, just that they can take one of several allowable forms. Normally these forms are FL_port, E_port and F_port as noted, with Paul adding TL_ports and SL_ports to the mix. Never is there a suggestion that a switch port would have an N_port as a possible form.

The remarks also state: “Therefore, when one switch is connecting to another fabric, one of ordinary skill in the art will concur that the switch is another node and the N_port recited is the same as the E_port taught by Paul.” Applicants submit that one skilled in the art would not concur that the switch is another node. The switch is a switch and the switch port will end up an

E_port as discussed above. This is fundamental to the normal operation of a switch and Paul teaches nothing different. The Final Office Action remarks seem to indicate a belief that any device that connects to a fabric is a node but such is not the case. When a switch connects to a fabric, the interconnected ports configure as E_ports and the added switch becomes part of and extends the fabric. Thus the switch is not a node and would not stay a node. Therefore the apparent belief that the switch would somehow have an N_port is improper and thus the premise that N_ports and E_ports are the same is improper, clearly not being suggested by Paul or the various Fibre Channel specifications.

The Final Office Action remarks conclude by stating that the features relied on by Applicants are not recited in the claims. Applicants first note that the remarks above relating to the various functions of the different ports are not being relied on to distinguish Paul. They are being used as support for the position that one skilled in Fibre Channel would not consider the various ports, N_port, E_port and SL_port to be equivalent or replaceable. The various functions mentioned are those which are required for operation as a particular type of port by the various Fibre Channel specifications, which one skilled in Fibre Channel would be aware of. Knowing those requirements is one reason a person skilled in Fibre Channel would not consider the port types to be equivalent as argued in the Final Office Action.

The various claims all require a switching device, switch or method of operating a switch, with the switching device or switch having fabric or F_ports, a node or N_port and a switch or switch circuit interconnecting the ports, a configuration of ports not taught or suggested in Paul, particularly when considered by one skilled in Fibre Channel. Applicants therefore submit that in the rejections a required element is missing when the teachings of Paul are properly considered.

Claims 17, 28, 39, and 50

The above arguments use claim 28 as exemplary and therefore correspond directly to claim 28 and very closely for claims 17, 39 and 50. Applicants respectfully submit that the rejections are improper and request withdrawal.

Claims 1, 9 and 101

Applicants submit that the above arguments apply equally to claims 1, 9 and 101. Further, Applicants submit that the preamble should be accorded patentable weight in this instance.

In this case, the preamble does not just recite a purpose or intended use. The preamble defines the environment in which the claimed switching device will operate, namely with a series of nodes and a first fabric. Indeed, these two items are recited in the body of the claims. Ignoring the preamble terms then would ignore these items and the required operation of the body elements with the preamble items would be left undefined. Proper interpretation of the body elements requires giving meaning to series of nodes and first fabric. As these terms are in the preamble, they must be given patentable weight. Therefore, the arguments made above with regard to claim 28 apply completely when the preamble is properly construed so that claims 1, 9 and 101 are allowable.

Claims 61, 71, 81, and 91

The arguments made with regard to claim 28 apply equally so that claims 61, 71, 81, and 91 are patentable. Further, claims 61, 71, 81, and 91 all require a second fabric. The Final Office Action simply uses a definition of a fabric to support rejecting this requirement for two fabrics. Paul only shows examples with a single fabric, not dual fabrics. While the definition of a fabric would apply to each fabric, the definition alone is insufficient to teach two fabrics, particularly when the specific connections between the node ports, the fabrics and the switching devices or switches is considered. As a result, claims 61, 71, 81, and 91 are allowable.

Applicants have repeated these arguments as they were not addressed in the Final Office Action.

Claims 2, 10, 18, 29, 40, 51, 62, 72, 82, 92 and 102

Claims 2, 10, 18, 29, 40, 51, 62, 72, 82, 92 and 102 all require the node or N_port to operate as a virtual node or N_port, with one virtual node or N_port address per fabric or F_port. The Final Office Action has cited to col. 3, lines 64-66 of Paul for the requirement of the node port operating as a virtual node port. Applicants do not understand this citation. Col. 3, lines 64-66 is part of the brief description of Figs. 3-5 and as such is not relevant. Applicants have reviewed lines 64-66 in each column in the patent and do not find any of them that appear relevant. The Final Office Action further cites to col. 12, lines 35-45 for the requirement of one virtual node address for each of the plurality of fabric ports connected to the numbers. This section of Paul describes an additional header used only internal to the Paul device and not relevant to the addresses of any of the external ports. Even then, the port IDs as identified on TABLE 2 (bits 0:5 of the first half word as noted in line 39) only provides for 64 addresses, effectively matching the 64 quid port boards shown in Fig. 4 of Paul. Thus these bits further cannot correspond to virtual node addresses as they simply are too short. The rejections are improper and must be withdrawn.

Applicants have repeated these arguments as they were not addressed in the Final Office Action.

Claims 107-117

Applicants submit these rejections are improper. As to claims 107-112 and 117, the arguments of claims 61, 71, 81, and 91 apply, further indicating no teaching of the required second fabric. The citation to col. 8, lines 38-41 just describes the fabric that interconnects the various F_ports of Paul, the single fabric described in Paul. The lines do not teach or suggest the required second fabric. As to claims 113-116, a third fabric is required. As the arguments to claims 61, 71, 81, and 91 show, Paul does not teach the required second fabric, much less a third fabric. Withdrawal of the rejections is requested.

Applicants have repeated these arguments as they were not addressed in the Final Office Action.

Application No. 10/767,405

Reply to Final Office Action of December 15, 2008

CONCLUSION

Based on the above remarks Applicants respectfully submit that all of the present claims are allowable. Reconsideration is respectfully requested.

Respectfully submitted,

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